

Name _____ Chemistry I: Nuclear Chemistry: **CHAPTER 22**

PERIOD _____ **DATE** _____

HALF-LIFE PROBLEMS

SOLVE THE FOLLOWING PROBLEMS.

1. An isotope of cesium (cesium-137) has a half-life of 30 years. If 1.0 mg of cesium-137 disintegrates over a period of 90 years, how many mg of cesium-137 would remain?
2. A 2.5-gram sample of an isotope of strontium-90 was formed in a 1960 explosion of an atomic bomb at Johnson Island in the Pacific Test Site. The half-life of strontium-90 is 28 years. In what year will only 0.625 grams of this strontium-90 remain?
3. Actinium-226 has a half-life of 29 hours. If 100 mg of actinium-226 disintegrates over a period of 58 hours, how many mg of actinium-226 will remain?
4. Thallium-201 has a half-life of 73 hours. If 4.0 mg of thallium-201 disintegrates over a period of 6.0 days and 2 hours, how many mg of thallium-201 will remain?
5. Sodium-25 was to be used in an experiment, but it took 3.0 minutes to get the sodium from the reactor to the laboratory. If 5.0 mg of sodium-25 was removed from the reactor, how many mg of sodium-25 were placed in the reaction vessel 3.0 minutes later if the half-life of sodium-25 is 60 seconds?

6. The half-life of isotope X is 2.0 years. How many years would it take for a 4.0 mg sample of X to decay and have only 0.50 mg of it remain?
7. Selenium-83 has a half-life of 25.0 minutes. How many minutes would it take for a 10.0 mg sample to decay and have only 1.25 mg of it remain?
8. Element-106 has a half-life of 0.90 seconds. If one million atoms of it were prepared, how many atoms would remain after 4.5 seconds?
9. The half-life of Po-218 is three minutes. How much of a 2.0 gram sample remains after 15 minutes? Suppose you wanted to buy some of this isotope, and it required half an hour for it reach you. How much should you order if you need to use 0.10 gram of this material?
10. Three grams of Bismuth-218 decay to 0.375 grams in one hour. What is the half-life of this isotope?
11. The half-life of francium is 21 minutes. Starting with 4×10^{18} atoms of francium, how many atoms would disintegrate in 1 hour and 45 minutes? What fraction of the original sample remains?
12. The half-life of a radioactive element is 30 seconds. In what period of time would the activity of the sample be reduced to one-sixteenth of the original activity?